Winter 12-1932

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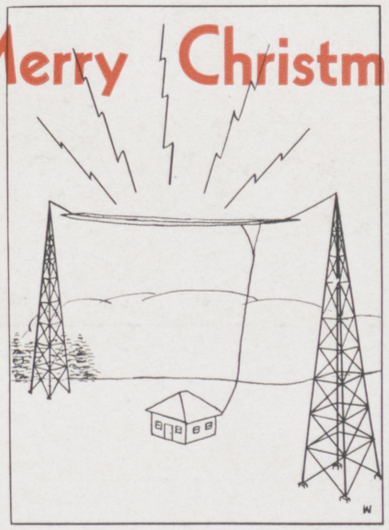
Rose Technic Staff
Rose-Hulman Institute of Technology

Rose Technic

Merry Christmas



1932

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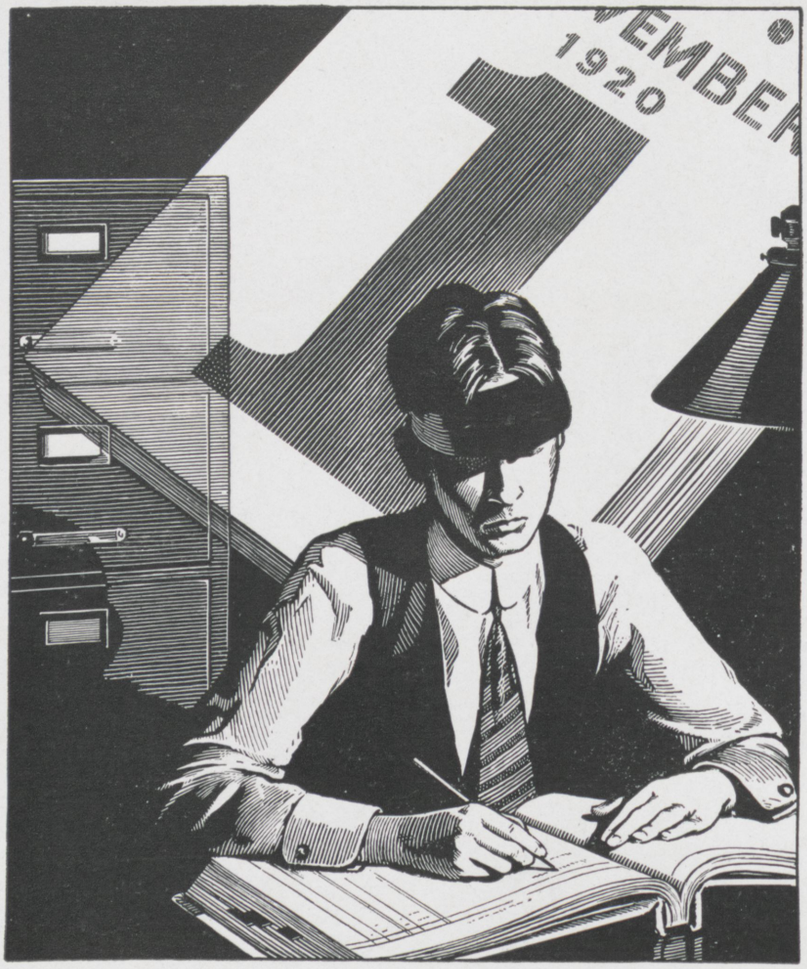
ROSE POLYTECHNIC INSTITUTE



It *haunted* clerks for generations

"The first of the month" used to be a time of feverish activity for ledger clerks. But the Bell System accounting staff—breaking away from tradition—simplified the keeping of accounts and rendering of monthly statements to customers.

They applied a modern system of *rotation billing* to the telephone business which now spreads this work evenly throughout the month. In co-operation with manufacturers, they devised special typewriters and bookkeeping machines. Thus they did away with inefficient rush and achieved greater accuracy, speed and neatness.

This is but one example of a point of view found throughout the Bell System. Even long accepted routine is constantly studied—it's always worth looking for the more efficient way!

BELL SYSTEM

A NATION-WIDE SYSTEM OF INTER-CONNECTING TELEPHONES

Surveying This Issue

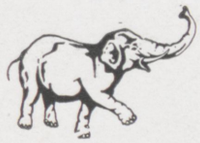
ONE of four new passenger liners built for the Grace Lines, the *Santa Paula,* is shown "bows on" on the frontispiece. These four "Santa" ships, together with two others built for another company for transatlantic service, are expected to do much toward regaining America's place on the sea.

IN the lead article, Mr. Ritter describes "the most intricate machine devised by man"—the linotype machine. Anyone who has ever seen this remarkable mechanism in operation will not question the truth of the qualifying phrase.

SUPERSATURATED steam forms the subject of a valuable article by Professor Carl Wischmeyer. While this form of steam is of great importance in turbine design and performance, its properties and behaviour have only recently been investigated, and little information about it is available.

CHEMISTS have sought for many years to unravel the mysteries of catalysts and catalytic reactions. Recent research has led to the discovery of many new and important catalysts and to a partial understanding of their function. One of the most universally used catalysts, nickel, is discussed from the stand-point of hydrogenation processes in an article by Mr. Heidenreich.

WHILE we engineers are apt to be interested most in the things that are of most recent development, we nevertheless enjoy reading occasionally about older things. Mr. Ahlers, a graduate of last June, has contributed an unusual paper about one of the earliest railroads in this country.



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Mr. Robley Winfrey, Chairman, Engineering Hall,
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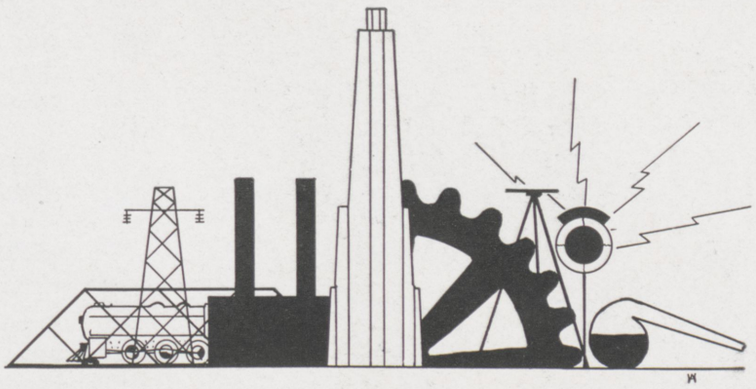
The *Santa Paula*, "Bows on"



THE ROSE TECHNIC

THE TECHNICAL JOURNAL OF THE ROSE POLYTECHNIC INSTITUTE

Volume XLII DECEMBER 1932 Number 3

The Intricacies of

The Linotype Machine

By John A. Ritter, m., '34

IN beginning this article on the linotype, the writer wishes to clarify the reader's mind as to the fundamental purpose of this machine. The linotype is a typesetting or typemanufacturing machine. *It is not a printing machine.*

The writer has been advisedly informed that the linotype is one of the most complicated machines ever invented and developed, consisting of approximately 20,000 parts—but don't become discouraged, for this machine is very human, they say, once you understand it!

It was about 1883 that the first attempts in developing a line casting machine, for "setting type in a line," were made. Naturally, this first machine was very impractical and of little use other than as an experiment toward the ultimate success of the present-day linotype, which is now in universal use in composing rooms of printing establishments.

In the following article, Mr. Ritter has attempted to give the reader an idea of the operation of a linotype machine. Although this machine is not a recent development, it has contributed materially to the rapid advancement of the printing industry.

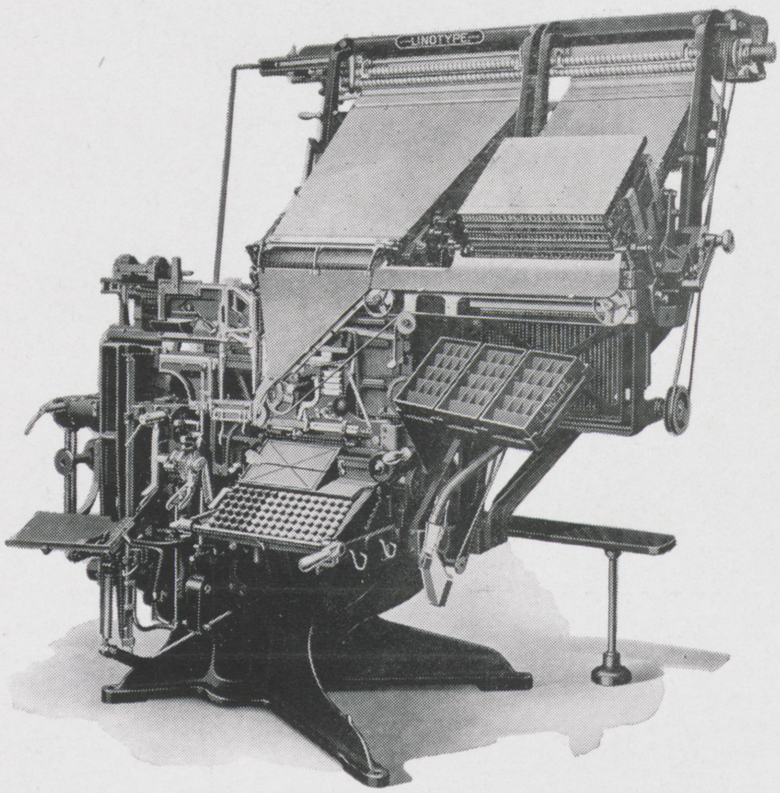
With financial backing of some prominent men of that day, Ottmar Mergenthaler, the inventor, whose name the machine bears (Mergenthaler linotype), laboriously continued to experiment, until, in 1886, he completed a machine which successfully made composition of type possible on a commercial scale. Only about two hundred of these were made and put into use before this design was discarded and new improvements were made, which development continued, in rapid succession, until we have the perfected linotype of today.

The modern linotype, which is the product of the collaboration of the practical men of the trade (the operators and machinists), and of the company's engineers, has three distinct functions; when segregated they are very interesting in themselves. They are:

1. Assembling a line of brass matrices.
2. Casting a line of type from the matrices.
3. Distributing the matrices after the line of type has been cast.

The parts of the machine performing these functions are the assembling mechanism, the casting mechanism, and distributing mechanism.

In dealing with the assembling



This new machine sets six different kinds of type from one keyboard.

mechanism of the linotype, the writer wishes to point out its important features, the magazine and the keyboard.

The magazine is a brass plate about 28 inches long, 22 inches wide across the top, and 16 inches wide at the bottom. It contains the brass matrices, being grooved so the matrices can slide down to the front of the magazine and directly over the verges. The verges hold the matrices in "waiting" position and allow them to drop when the operator at the keyboard depresses keys.

Each matrix has a die-cut letter, figure or punctuation mark in it, from which the character is cast when the molten metal is forced into the die-cut impression. There are 90 matrix characters and about 21 matrices of each character.

In front and to the right of the machine is the keyboard of 90 celluloid keys, corresponding to the 90 characters of matrices contained in the magazine. Each key indirectly engages a verge in the magazine, and permits a matrix to leave its groove (or channel).

When the operator at the keyboard depresses a key, the key goes down about one-fourth of an inch and the opposite end of the key rod on which the key is fastened moves upward. This motion permits a trigger inside the keyboard to release a small brass cam above a rubber roller (two rubber rollers run the length of the keyboard), and the cam, being saw-toothed, clings to the rubber roller and revolves. In its revolution, the cam raises the yoke in which it sets and this in turn raises a reed rod running to the magazine. When this rod rises, it engages the verge and the matrix is released.

Now that the matrix is free to travel because of the operating of the keyboard, it is taken by gravity to a belt and conveyed to the assembler, where matrix after matrix consecutively aligns to make a line of little brass molds.

To separate the words, a space bar is depressed in the course of operating the keyboard and a spaceband "drops" between words. The spacebands are wedge shaped. When sufficient words have been assembled to make a line, the operator depresses a lever to his right and the line of brass matrices as a single unit is raised up to grooves called the "line delivery transfer slide". Here a carriage takes the line to the left and into the first elevator. The carriage is actuated by a large coil spring, and returned to its original place by a cam (No. 9) in the rear of the machine.

This entire section of the machine could be classed as light automatic trigger work.

Casting Mechanism Operated by Cams

Before the casting mechanism starts moving, the "first elevator" is in a stationary position called "home". When the carriage reaches the end of the line delivery transfer slide, it trips a clutch mechanism and the casting mechanism starts to function.

The first elevator, operated by cam No. 1 in rear of the machine, lowers to casting position. This aligns the matrices with a steel mold in the mold wheel (disc wheel), which disc has made one-quarter revolution and is operated by segments on cam No. 2 in the rear of the machine. The mold wheel, or disc wheel, is located directly in front of the metal pot.

The metal pot, full of molten metal heated to 550 degrees F, moves forward approximately two inches, until it is flush against the mold wheel. The metal pot is operated by cam No. 7 in the rear of the machine.

During the course of the operation of the first elevator, mold wheel and metal pot, as before mentioned, the spacebands separating the words have been justifying the line of matrices between two jaws in the "head" of the first elevator. The spacebands are wedge shaped and are driven upward by a justification bar operated by cams No. 3 and 4 in the rear of the machine. Justifying the line of matrices makes each line exactly the same length.

The machine is now in the "lock-up" position and ready to cast a line of type.

A plunger which fits perfectly into the well of the melting pot goes down, operated by cam No. 6 in the rear of the machine, forcing the molten metal through the pot throat and out of the

(Continued on Page 21)

Supersaturated Steam

By Professor Carl Wischmeyer

Head of the Mechanical Engineering Department, Rose Polytechnic Institute

OF the various fluids used in engineering processes, such as power generation, refrigeration, etc., water is by far the most common, and it is natural that researches have made available to the engineer the properties of water to a much greater degree than is true of the other fluids. While a reasonable amount of information is available for such fluids as ammonia, mercury, sulphur dioxide, carbon dioxide and others, these data are not as nearly complete as in the case of water.

The properties of a fluid which are of importance include the freezing and boiling temperatures at various pressures, the specific heat in the solid state, the latent heat of fusion, the specific heat of the liquid, the latent heat of vaporization, the specific heat of the superheated vapor, specific volumes (or densities) and entropies throughout the range of pressures and temperatures which are likely to be encountered in practice. For water, extensive tabulations of these properties are available. The latest of these was published by the American Society of Mechanical Engineers in 1930, and was the result of research work carried out under the joint auspices of the Society, the General Electric Company, the Bureau of Standards and Massachusetts Institute of Technology. Professor Joseph H. Kienan, of the Stevens Institute of Technology was the author of these tables.

None of the tables so far available gives data on very low pressure superheated steam, a condition corresponding to atmospheric moisture. However, such water vapor follows very closely the perfect gas laws, and enthalpy (total heat) may be taken from saturated steam tables. Neither do the steam tables give any data on freezing of water into ice; in fact such data would be of very little practical value.

At atmospheric pressure, water freezes at 32° Fahrenheit, and this freezing temperature changes very little at pressures other than atmospheric, decreasing slightly for pressure above atmospheric. Similarly, at atmospheric pressure water boils at 212° Fahrenheit, but this value increases rapidly at higher pressures.

Supersaturation an Unstable Condiiont

If the process of heat transfer takes place slowly enough, thermal equilibrium will be maintained, and at atmospheric pressure ice will melt or water will freeze at 32°; also water will vaporize or steam will condense at 212°. If a process takes place too quickly, it is possible to have a condition of unstable equilibrium, and water may be liquid at a temperature below 32° or above 212°. Similarly, steam may remain in the vapor state at temperatures below the normal condensation point. Such conditions are of course unstable, and will not persist except for short time intervals. In fact these unstable conditions are of little practical importance, except in the one case of expansion of steam in a nozzle, when velocities are so high that the time interval is of the order of one thousandth of a second or less.

Due to this short time interval, it can be assumed without appreciable error that the expansion of steam in a nozzle is adiabatic, that is without any loss of energy as heat. There is necessarily a small loss of kinetic energy due to friction, which is accompanied by an increase of entropy, but experimental data are available which make it possible to evaluate this. Adiabatic expansion of steam, even with increasing entropy, involves progressive condensation as the pressure drops. If the steam is initially superheated, condensation will begin later, but if we assume that thermal equilibrium is maintained, condensation is bound to occur if the pressure drops sufficiently.

The process of condensation of steam accompanying expansion in a nozzle is one which requires certain conditions. In order for the steam to remain in thermal equilibrium, part of it must condense and form droplets of liquid water, which can take place only if the steam contains nuclei or ions about which the particles of liquid water can gather in forming the droplet, and this process requires a definite, but quite small time interval. If such nuclei are not present, or if the time interval is too small, condensation with formation of droplets of liquid water will not occur, the steam is

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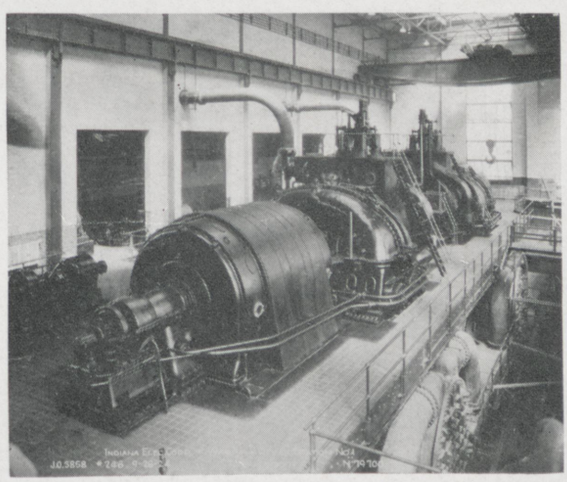

Supersaturation occurs in steam turbo-generator units.

Nickel as a Catalyst For Hydrogenation

By William C. Heidenreich, ch. e., '33.

THE first scientific observation of a catalytic action was made by Kirchhof, who in 1811 showed that mineral acids in a hot water solution change starch into dextrine and sugar, without themselves being altered by the reaction.

A short time later Sir Humphrey Davy observed that if a slightly heated spiral of platinum wire was introduced into a mixture of air and combustible gas, hydrogen, carbon monoxide, or hydrocyanic acid, it becomes incandescent and causes the slow oxidation of the gas. In 1831, Peligrin Phillips took out an English patent on the use of platinum sponge to oxidize by air the sulphur dioxide obtained by roasting pyrites to form sulphur trioxide. This process was the germ of the contact sulphuric acid process, which was developed a half century later.

Berzelius, in his "Treatise on Chemistry," adopted a term to cover these phenomena and called it a catalytic action. The word catalytic comes from two Greek words meaning, "I unloose."

Types of Catalytic Reactions

The reactions in which catalysis is observed have enlarged with the growth of chemistry, even though there are so many types of catalytic reactions, that Sabatier has attempted to divide these reactions into two distinct groups.

First we have catalysis in a homogeneous system, that is, where there is an intimate mixture of the various constituents or at least between one constituent and the catalyst. This is the case with water vapor in gaseous mixtures, with zinc chloride in the dehydration of alcohols, and with many other systems.

The second group is that of heterogeneous systems in which a solid catalyst is brought in contact with gaseous or liquid systems capable of reacting. The solid catalyst acts only by its surface and therefore is necessarily made very porous.

Definitions

Ostwald suggested that those reactions in which the product of the reactions accelerates the reaction be called a system of autocatalysis.

Thus, hydrogen and oxygen, when dried thoroughly, do not combine at 1000°, but if the reaction is started, the water vapor formed greatly favors the reaction, rendering it explosive.

Certain materials when present in a chemical system exercise an unfavorable or retarding effect. These materials are called negative catalysts.

As early as 1824 Turner observed that traces of sulphides suppress the catalytic ability of platinum and nickel.

Negative catalysts are becoming quite important because of their stabilizing effects on certain chemical systems. The addition of a few hundredths of one percent of sulphuric or hydrochloric acid to hydrogen peroxide considerably augments its stability.

The spontaneous oxidation of chloroform to carbonyl chloride is hindered by the presence of a little alcohol.

The formation of the organomagnesium halides by the Grignard reaction is retarded by the presence of ethyl acetate.

The velocity of a catalytic reaction depends upon three things primarily:

1. Temperature.
2. Pressure.
3. Quantity of catalysts.

The temperature necessary to bring about a reaction is very important and plays a capital role. For instance, up to a certain temperature benzene and hydrogen do not react in the presence of nickel, while past that temperature the reaction products are good until a high temperature is reached, and at this temperature the reaction product, cyclo-hexane is decomposed to benzene and hydrogen or even to methane.

$$3C_6H_{12} \rightarrow 2C_6H_6 + 6CH_4$$

An increase of pressure can scarcely have any considerable effect except in gaseous systems or heterogeneous systems having a gaseous phase. In these types of systems the increase of pressure will have a beneficial effect in those cases in which the number of molecules is diminished by the reaction.

Little is known about how to predict the quantity of catalysts. The industries use the quantity of catalysts which has given them the greatest yield over a period of time.

Types of Catalysts

As chemistry has developed, the number of catalytic phenomena has increased enormously and it has been recognized that a multitude of bodies are catalysts.

Solvents are considered as a catalyst because they do not appear in the reaction which they cause to take place.

The number of substances that can act as a catalysts is already large and continues to increase with the progress of chemistry.

We find as catalysts: elements, oxides, mineral acids, bases, metallic chlorides, bromides, iodides, and many other types of compounds.

Nickel Catalysts in Organic Chemistry

When nickel is employed in an extremely fine condition it is a marvelous catalyst. The manifold activity of nickel as a catalyst has been established by the work of Sabatier and Sendersens, beginning in 1879.

An excellent quality of nickel may be obtained by dissolving the commercial cubes in pure nitric acid (free from hydrochloric acid), calcining the nitrate at a dull red heat, and reducing at about 300° the oxide thus formed. The oxide is reduced with pure hydrogen gas. The reduced metal must be carefully cooled in a current of hydrogen, or better still, pure nitrogen.

It has been suggested that the finely divided nickel formed in the decomposition of nickel carbonyl by heat be used. In order to bring about this reaction, finely divided nickel is kept suspended in oil at about 180°, and a current of carbon monoxide is sent through. This transforms the nickel to nickel carbonyl which immediately breaks down with heat to carbon, carbon dioxide, and finely divided nickel. The nickel thus formed is suspended in the liquid and the liquid is ready to realize its hydrogenation.

Recently the finely divided nickel has been spread over and throughout porous inert materials such as, fullers earth, asbestos, pumice, and wood charcoal.

Nickel oxide and especially nickel suboxide (NiO_4) are regarded by some chemists as the best catalysts for carrying out hydrogenation of organic compounds in the liquid medium.

Great care must be exercised during any catalytic process using nickel as a catalyst, especially in regard to poisons. Sulphur, chlorine, and sulphides readily attack and kill the power of nickel as a catalyst; therefore the compounds used in the reaction must be very pure.

Hydrogenations with Nickel Catalysts

A. The Hydrogen.

The hydrogen may be prepared by the action of commercial hydrochloric acid on ordinary granulated zinc. The gas is washed with strong caustic soda and then with concentrated sulphuric acid. The hydrogen must be carefully purified from impurities derived from the zinc or from the acid. In order to do this the gas is passed through a tube of Jena glass, filled with copper turnings kept at a dull red, which stops the major part of the impurities.

The purification is completed by passing the gas through a long tube filled with slightly moist fragments of caustic potash which retains acid vapors as well as any remaining hydrogen sulphide.

Electrolytic hydrogen, which is on the market in steel cylinders at high pressures, can be used to an advantage. This type of hydrogen is nearly pure and the slight impurities that it does contain may be taken out by passing the gas over red hot copper in a tube followed by a drying tube containing caustic potash.

B. The Reaction Tube.

In a glass tube 65 to 100 cm. long and 14 to 18 mm. inside diameter, a longer or shorter (35 to 80 cm.) thin layer of oxide, from the catalytic metal to be prepared, is spread. The tube is heated in a gas furnace such as is used for organic combustions.

C. Introduction of the Substance.

The method of introducing the substance to be hydrogenated varies, of course, according to its physical state.

If it is a gas the forward end of the tube containing the catalyst carries a two-hole stopper with two tubes, one for the gas and one for the hydrogen.

If it is a liquid, Sabatier and Senderens have devised an extremely simple apparatus.

It is important to watch that the liquid does not wet the catalyst which is frequently altered by contact with the liquid.

We may also operate by bubbling the hydrogen through the liquid to be hydrogenated, thus carrying along the vapors.

For solid substances which melt below 100°, the above mentioned apparatus may be used. Solids melting below 100°, may be kept fused by a suitable air bath and the vapors carried on by the hydrogen which is bubbled through.

When the substance melts above 100°, it is placed in porcelain boats in the forward part of the tube. The volatization of the substance is secured by careful heating. The reaction, of course, is limited to the amount of material in the boats and is intermittent.

D. Collecting the Reaction Products.

If the products of the hydrogenation are gases, they are collected at the end of the catalyst tube in a gas holder over water. The water is saturated with common salt to diminish the solubility of the gases.

If the products are liquid the reaction tube is connected to a condenser.

If the reaction gives solid materials, the solids are collected by inclining the tube.

E. Reaction Temperatures and Pressures.

The temperatures and pressures necessary for a given reacaction have been determined by experiment and will be given for each reaction. There is no set rule for any reaction to take a definite temperature and pressure, unless

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A Pioneer Railroad - - -

The Camden and Amboy

By Albert L. Ahlers, '32

THE HISTORY of rails as used by present day railroads can be traced to the organization of the Camden and Amboy Railroad and Transportation Company. This Company was incorporated by special charter in February, 1830, and was authorized to survey, lay out and construct a railroad from the Delaware River to Raritan Bay, with as many tracks as might be deemed necessary, provided the width of roadway did not exceed one hundred feet. The road was to be started within two years and completed within nine, otherwise the charter would be declared null and void.

The president of the new company was Robert L. Stevens, son of Colonel John Stevens, who was a pioneer in advocating the steam engine as motive power in land transportation. As no iron suitable for railroad rails was available in the United States, President Stevens made a trip to Europe to study the situation. While on ship-board, he worked out tentative designs for a crude but practical form of T-rail, which was similar to the general form of the rail used today. The new rail was designed to dispense with the old wooden or shore stringer plated with iron, which was the form of rail in use one hundred years ago. The Camden and Amboy Railroad, therefore, was the first in this country, and probably first in the world to employ the T-rail.

While Mr. Stevens was abroad he also investigated the question of motive power, and witnessed the trials of the locomotive "Planet," an engine built by Robert Stephenson and Company, of New Castle-on-Tyne, England. He was so favorably impressed that he ordered a similar locomotive for the Camden and Amboy Railroad which was completed in May, 1831, and was shipped by sailing vessel in June, arriving in this country about the middle of August.

Tender is Improvised

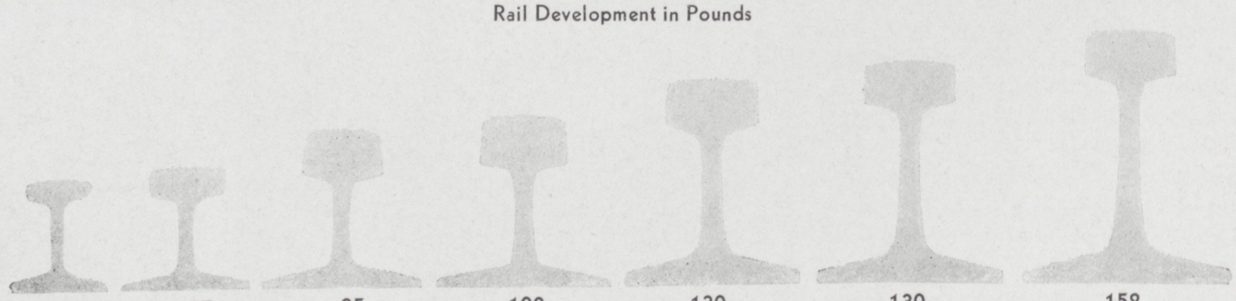
The new locomotive was originally named Stevens, but this was changed to John Bull. Isaac Dripps, an apprentice machinist of exceptional ability, was engaged by Mr. Stevens to erect the locomotive and place it in service. This he successfully accomplished, although he had no drawings to serve as a guide. A tender was improvised out of a small four-wheel car, on which Dripps mounted a whiskey cask to serve as a water tank. A neighboring shoemaker contrived a leather pipe, which formed a connection between the whiskey cask and the feed pipe on the locomotive. The four wheels of the engine were all of the same size, and were coupled by side rods. Owing to the many curves on the line, however, these rods were removed to permit greater flexibility. Mr. Dripps devised a hinged frame, carrying a crude form of pilot, and supported by a single pair of leading wheels. The need for such an arrangement was recognized, as the railroad was not fenced and live stock could easily use the tracks as a thoroughfare. The John Bull weighed approximately eleven tons, and had 9x20-inch cylinders and wheels fifty-four inches in diameter, had a firebox with a hemispherical top. Wood was used as fuel. The wheels had cast iron hubs and wooden spokes and felloes; and the tires were of wrought iron, three-quarters of an inch thick, with a five-inch tread. The track gauge was five feet.

The Camden and Amboy Railroad was completed between Bordentown and South Amboy in 1832, and the following year was extended to Camden. During the late sixties, the C. and A. Company was combined with two other companies to form the United New Jersey Railroad and Canal Company. This company, in 1871, was acquired by the Pennsylvania Railroad Company.

Early Rails Laid on Stone

The first T-rails used in the track of the Camden and Amboy Railroad reached Philadelphia on May 16, 1831. They weighed thirty-six pounds to the yard, and were rolled in lengths of eighteen feet. These rails were laid on

Rail Development in Pounds



stone blocks which were bought from the prison authorities at Sing Sing, New York. The rails were secured to the blocks by a then newly-devised hook-headed spike, which was the forerunner of the spike now in general use. The ends of the rails rested on wrought iron plates and were connected by iron tongues which were riveted to the rail ends, thus completing the joint.

The Camden and Amboy track is also of interest because, on a section of the line near South Amboy, the practice of spiking iron rails directly to wooden crossties was used for the first time in railroad history. The authorities at Sing Sing failed to deliver the stone blocks rapidly enough, and therefore, in laying the track through a deep cut near the town, the engineers in charge ordered hewn ties to be laid temporarily, and the rails were spiked directly to the ties. To the surprise of all, the ties gave such satisfactory service that they were permitted to remain, and subsequently the stone blocks in the track were gradually removed and replaced by wooden ties.

Original Track Still Exists

A piece of the original Camden and Amboy track, about three hundred feet in length, is still in existence near Jamesburg, New Jersey, about twenty miles northeast of Trenton. This piece of track is paralleled by one of the modern tracks of the Pennsylvania Railroad, and passengers en route between Bordentown and South Amboy can easily see it. It is probably the oldest piece of railroad track now in existence in the United States.

A striking contrast to the light rails used in this old track is afforded by the latest development of the steel rail adopted by the Pennsylvania Railroad. This is a section weighing one hundred and fifty-two pounds to the yard, and designed to carry an axle load of one hundred thousand pounds at speeds up to one hundred miles per hour. It provides approximately seventy-five per cent greater stiffness

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The Engineer---A Parable

ONE DAY three men, a lawyer, a doctor and an engineer, appeared before St. Peter as he stood guarding the Pearly Gates.

The first man to step forward was the lawyer. With confidence and assurance, he proceeded to deliver an eloquent address which left St. Peter dazed and bewildered. Before the venerable Saint could recover, the lawyer quickly handed him a writ of mandamus, pushed him aside, and strode through the open portals.

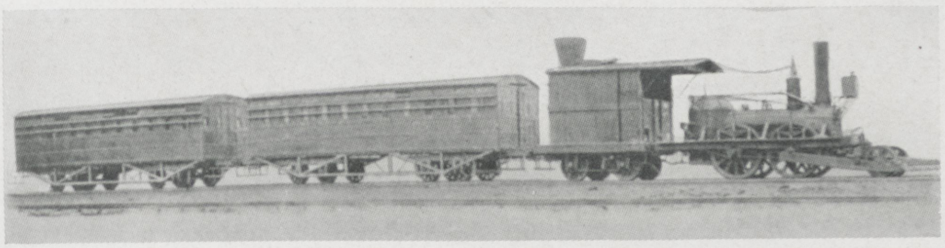
Next came the doctor. With impressive, dignified bearing, he introduced himself: "I am Dr. Brown." St. Peter received him cordially. "I feel I know you, Dr. Brown. Many who preceded you said you sent them here. Welcome to our City!"

The engineer, modest and diffident, had been standing in the background. He now stepped forward. "I am looking for a job," he said. St. Peter wearily shook his head. "I am sorry," he replied, "we have no work here for you. If you want a job, you can go to Hell." This response sounded familiar to the engineer, and made him feel more at home. "Very well," he said, "I have had Hell all my life and I guess I can stand it better than the others." St. Peter was puzzled. "Look here, young man, what are you?" I am an engineer," was the reply. "Oh yes," said St. Peter; "Do you belong to the Locomotive Brotherhood?" "No, I am sorry," the engineer responded apologetically; "I am a different kind of engineer." "I do not understand," said St. Peter; "what on Earth do you do?" The engineer recalled a definition and calmly replied: "I apply mathematical principles to the control of natural forces." This sounded meaningless to St. Peter, and his temper got the best of him. "Young man," he said, "you can go to Hell with your mathematical principles and try your hand on some of the natural forces there!" "That suits me," responded the engineer; "I am always glad to go where there is a tough job to tackle." Whereupon he departed for the Nether Regions.

And it came to pass that strange reports began to reach St. Peter. The Celestial denizens, who had amused themselves in the past by looking down upon less fortunate, commenced asking for transfers to that other domain. The sounds of agony and suffering were stilled. Many new arrivals, after seeing both places, selected the Nether Region for their permanent abode. Puzzled, St. Peter sent messengers to visit Hell and to report back to him. They returned, all excited, and reported to St. Peter:

"That engineer you sent down there," said the messengers, "has completely transformed the place so that you would not know it now. He has harnessed the Fiery Furnaces for light and power. He has cooled the entire place with artificial refrigeration. He has drained the Lakes of Brimestone and has filled the air with cool perfumed breezes. He has flung bridges across the Bottomless Abyss and has bored tunnels through the Obsidian Cliffs. He has created paved streets, gardens, parks and playgrounds, lakes, rivers, and beautiful waterfalls. That engineer you sent down there has gone through Hell and has made of it a realm of happiness, peace, and industry!"

Reprinted from "The Amer. Engineer"



The old John Bull locomotive and train on the C. & A. a century ago

Published Monthly by the Students of Rose Polytechnic Institute

THE ROSE TECHNIC

A Magazine Pertaining to Engineering and Allied Sciences

Member of Engineering College Magazines Associated

Book Ability

TWO fundamental abilities required of engineering graduates are knowledge of facts and knowledge of where and how to find facts. The former is the chief aim of most college courses; the latter is assumed, expected to be learned indirectly, or neglected entirely as a general rule. A few courses are being offered in library usage and reference work, but much remains to be done. At the University of Michigan a course in bibliographical methods is required in the chemical courses, which is one of the best developed and most comprehensive.

A great deal of time is wasted in inferior laboratory technique, poor apparatus, and original work on subjects already exhaustively covered, when a few minutes effectively spent in searching references and records would obviate this waste. Usually omission of this procedure or ineffective search results in inefficient work.

For students it is valuable to make a discovery original to them, even if it has been done before, but for an industrial worker thus to waste his time is inexcusable. There is a very real demand for training in this sort of research work.

A few subjects which should be covered in such a course are: indexes to periodicals, card catalogs, abstract journals, monographs, dictionaries and encyclopedias, ordinary textbooks, and patents.

An elementary consideration of these will show the necessity of one or more foreign languages, especially German or French, and will show their practical utility.

Many graduates will know vaguely of the existence of these aids to effective work, but will have had no actual contact with them. Until such courses are offered in the curricula, it will pay all students to investigate the subjects for themselves.

New Lamps for Old

The depression has brought about the development of dozens of new devices to catch the public eye. Novelties have furnished the business where old standby articles have slumped. Now that recovery seems to have begun, a great hue and cry is being raised to replace old equipment and processes with new. As always, caution must be used. Many novelties and new developments, though containing some valuable features, have a great deal against them.

There is much truth in the claim that now is an unusually good time to replace antedated methods and machines. Prices are far below average. Orders are scarce enough that more particular care is given each one. Satisfaction and service are guaranteed and delivered even more than normally. Additional time and demand for research have made unusual progress in new developments.

Despite these arguments, the advantages and disadvantages of reequipping a plant, redesigning a machine, or buying a new automobile must be weighed even more carefully than in less precarious times. Business is still shaky, and cannot stand the shock of a bad guess or a glaring misjudgment.

Writing Popular Science

Literary efforts are not usually considered by embryo engineers as exactly in their line, but with ordinary jobs as scarce as the proverbial hen's teeth, nothing should be overlooked. One field for which a technical training should give a foundation is writing scientific articles for the layman. A real service has been performed and, incidentally, a good livelihood made by such men as Edwin

Slosson and Floyd Darrow, who have the ability to grasp new ideas and express them so untrained people can understand and in such a way that they will wish to know about them.

First of all the subject must be worthwhile. The reader must see at once that at some time he might profit by knowing something about it. It must be written in a style that will attract and hold him, but this must not be the primary consideration. If form and expression are the ends desired, one's efforts should be directed towards fiction and poetry, instead of science, but style can be combined with actual information to good ends.

The condescending attitude should not be too prominent. The reader feels that he is a little above the average intelligence and does not need too elementary treatment. Nevertheless, a very fundamental foundation must be laid. The reader probably knows much less than he pretends to know.

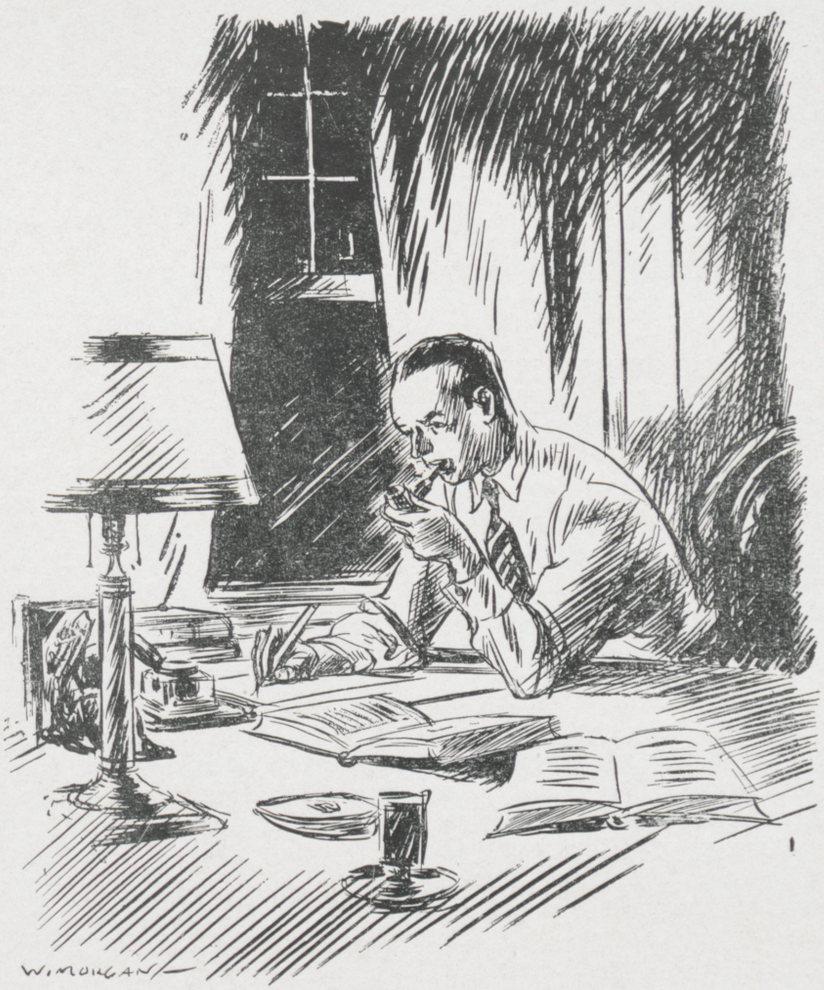
Practice here is as valuable as in all other subjects, and the *Technic* offers a good place to try your literary wings. Most of the articles published lean toward the popular more than the strictly technical side. Thus you can gain valuable experience and at the same time help your magazine.

Cooperation

The term teamwork has been used and misused until it carries a distinct prejudice. It seems to imply "all working together like one big family" and every trite and disagreeable modern business method. Nevertheless, there is much to the idea, however stated.

Science and technology is becoming so versatile and comprehensive that it is impossible for one man to keep abreast with more than a small branch of his subject. In order to solve a fairly general problem, the assistance of many specialists is required. These men must be capable of working together harmoniously and effectively.

In the past, stress has been laid on the need for intense specialization by individuals along narrow lines. In order to make this specialized knowledge of any value, cooperation among specialists is necessary. Their training must include working with others; the ability cannot be developed alone. In addition, some men must be trained in organizing, coordinating, and balancing the various branches, and making general decisions.



The prevalence of committees in every line of endeavor is evidence that it is realized that no one person can be competent to deal with many problems. The hackneyed expression "Two heads are better than one" still applies.

Ability to cooperate and help others in their work is never overestimated as an asset for an engineer.

The Importance of Looking Backward

The idealistic principle of keeping our eyes ahead, forgetting what is past and cannot be undone, and "looking forward to the new day" is somewhat fallacious. It is all very well to let bad mistakes be forgotten, enough to prevent brooding and regrets, but much profit may be obtained by an impartial study of them. The analogy of a man rowing a boat has been made; it is just as possible to row in a straight line by looking backward with only an occasional glance forward as the opposite.

The cyclic occurrence of business depressions shows how little regard is given to the past. Circumstances leading up to each one have been very similar, yet few people could trace the comparison far enough to foresee the inevitable result of wild speculation and overexpansion.

A trite but quite apropos paraphrase might be made, "The past we have always with us". It cannot and must not be disregarded.

J. D. McN.

ALUMNI

Edited by Richard K. Toner, ch. e., '34

MERRY CHRISTMAS! And since 1933 will be well upon its way before this column appears again, may we also say "Happy New Year."

Next month we will print all changes of address that have come to our attention since the beginning of this school year. All members of the Alumni Association have their addresses recorded. For all other alumni, we depend upon newspaper clippings, verbal reports, and in some few instances the actual reporting of the change of address to the Registrar. If you have not notified us of your change of address, please do so at once. And, incidentally, don't forget to write us any alumni news that you may know.

Franklin P. Adams once wrote a poem that appeals to this editor. What do you think of it?

The Rich Man

The rich man has his motor-car,
His country and his town estate.
He smokes a fifty-cent cigar
And jeers at Fate.

He frivols through the livelong day,
He knows not Poverty, her pinch.
His lot seems light, his heart seems gay;
He has a cinch.

Yet though my lamp burns low and dim,
Though I must slave for livlihood—
Think you that I would change with him?
You bet I would!

The Products of the Engineering Colleges

Dr. Donald B. Prentice, President of Rose Polytechnic Institute, wrote an article entitled "The Product of the Engineering Colleges" which appeared in the October 1932 issue of *Mechanical Engineering*. This article dealt with the distribution of the alumni of various colleges and universities in "Who's Who in Engineering." It is our purpose to present in brief the data appearing in this article.

Quoting from the preface of "Who's Who in Engineering":

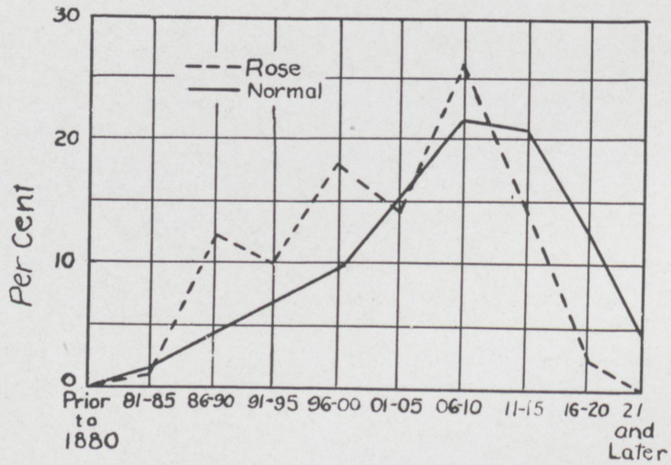
"The Advisory Committee voted to include engineers whose experience gave them the following qualifications:

a Engineers of outstanding and acknowledged professional eminence

b Engineers of at least ten years' active practice, at least five years of which have been in responsible charge of important engineering work

c Teachers of engineering subjects in colleges or schools of accepted standing who have taught such subjects for at least ten years, at least five years of which have been in responsible charge of a major engineering course in such college or school."

In this edition of "Who's Who,"



Institution	Founded	Total Number Graduates	Graduates in Who's Who Number	Graduates in Who's Who Per Cent
Michigan School of Mines	1885	1320	96	7.27
Rose Polytechnic Institute	1874	1463	71	4.85
Colorado School of Mines	1871	1722	82	4.76
Worchester Polytechnic Institute	1865	3098	145	4.68
Mass. Inst. of Technology	1861	15804	664	4.20
Stevens Inst. of Technology	1870	3290	122	3.72
Purdue University	1874	7199 (eng'g)	254	3.53
Armour Inst. of Technology	1892	2646	82	3.09
Case School of App. Science	1880	3036	85	2.80
Rensselaer Polytech. Inst.	1824	4506	120	2.67
Calif. Inst. of Technology	——	1006	19	1.89
Brooklyn Polytechnic Inst.	1889	2400	38	1.58
Virginia Polytech. Inst.	1872	3003	37	1.23
Georgia School of Technology	1888	3000	33	1.10

there are biographies of 8,643 graduates of 284 American and Canadian Colleges and Universities. Lack of space prevents a complete recording of the distribution of these 8,643 men. Rose Polytechnic Institute and Maine tied for 31st place with 71 graduates each.

If the data is reduced to percentages and then compared, there is perhaps a better basis for comparison, although the author warns, "Too much importance must not be attached to these values, although as far as they go they are probably as reasonable for comparison as any figures would be." Data on graduates of sixteen engineering educational institutions of similar type is tabulated at the bottom of the facing page.

It is interesting to note that of the 8,643 alumni listed, 4,467 were graduated from private or endowed institutions, 4,028 from state universities and colleges, and 148 from the United States Military and Naval Acadamies. Most of the engineering graduates in this third edition of "Who's Who" were in the classes from 1890 to 1920.

If a graph is prepared showing the number of alumni in "Who's Who in Engineering" by years of graduation, this may be considered a normal for purposes of comparison. No single institution contributed as many as eight per cent of the total alumni listed; consequently no one institution could have had an important influence on the normal.

The accompanying figure shows how Rose Polytechnic Institute compares with the normal. Our alumni have placed us in an enviable position among the engineering institution of the United States and Canada.. It is up to the students now in school to keep Rose there.

Here and There with the Grads

'08 H. Earl Schmidt, who has been with the Shell Petroleum Company in Madison, Wisconsin has been transferred to Milwaukee.

(Continued on Page 25)

Robert Dallas Landrum

The field of ceramics is a field that is scarcely touched in the training at Rose. This is no doubt due to the specialized form of engineering which it represents. It is a source of great pride to Rose, however, that one of her sons, Robert Dallas Landrum of the class of 1904 has been largely responsible for much of the advancement in this field since his graduation.

Mr. Landrum was born in Terre Haute Feb. 8, 1882, the son of James Wesley and Kate (Tolbert) Landrum. Following his elementary and high school education, he entered Rose Polytechnic Institute and graduated in 1904 with a B.S. in chemical engineering. He secured his M.S. in 1909 and his Ch.E. in 1914.

Bob Landrum was the first chemical engineer to enter the enameling industry in America. He received his first practical experience with the Columbian Enameling & Stamping Co. He was with that company until 1907 when he left for the University of Kansas to become assistant professor of chemistry which position he held until 1910. In that year Bob joined the Lisk Mfg. Co. at Canandaigua, N. Y., as chemical engineer. Three years later he became consulting engineer for the Michigan Enameling Works at Kalamazoo and the General Stamping Co. of Canton, Ohio. In '14 he became affiliated with the Harshaw, Fuller, Goodwin Co. where he remained until 1922 when he became vice president of the Vitreous Enameling Co. and the Vitreous Steel Products Co. of Cleveland. Three years later he joined the Titanium Alloy Mfg. Co. where he has been for the past seven years. September first of this year Mr. Landrum again joined the Harshaw Chemical Co. and took charge of the Chicago office on October 1.

He has received wide recognition in the enameling industry and all through his professional career has limited himself strictly to this field. It was through his efforts and his initiative that the Enamel Division of the American Ceramic Society had its beginning. His work in this society was rewarded by his election to its presidency in 1924-25. He had previously served as trustee in 1918-20 and as vice-president 1923-24 in addition to being chairman of many committees.

Mr. Landrum has enriched the knowledge of the ceramic industry by his researches and two years ago his work received deserved recognition when he was made a Fellow of the American Ceramic Society. He has contributed to Ceramic literature by his books "Enamel" and "Bibliography and Abstract of Literature on Enamels" (the latter being compiled in cooperation with H. D. Carter), and many technical papers.

He is also a member of the American Chemical Society, having been secretary of the Cleveland section 1919-20, Cleveland Engineering Society, Society of Chemical Industry, Acacia, Societe de Chimie Industrielle, France, fellow A. A. A. S., Cleveland Chamber of Commerce. He belongs to several clubs, among them the Cleveland, University, Chagrin Valley Country, and

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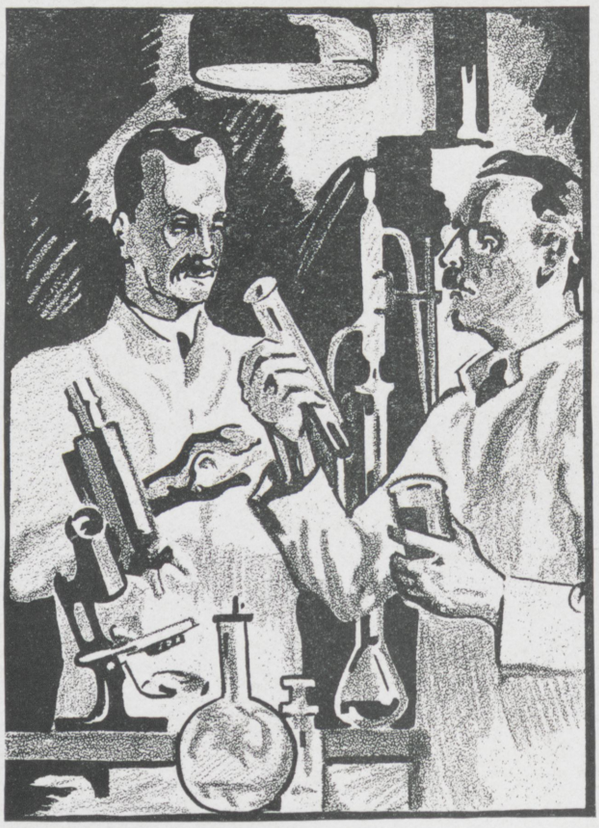
Research and Progress

Edited by Robert H. Swoboda, ch. e., '33



Photoelectric Cell in Newspaper Industry

Due to the exceptionally rapid development of photoelectric control in all industries, its use in the printing industry has recently been receiving especial attention and from this have come some sixteen direct and indirect applications.

One of the most remarkable developments is the rapid production of half-tones and three-color plates. Half-tone plates are made in a few minutes without acids, and really in less time than it takes to write the corresponding captions. Three-color plates are made in 30 minutes instead of the 36 hours hitherto required.

In the process, the photograph used is mounted on a revolving cylinder which is scanned by a phototube at a rate of about 10 square inches per minute. The photoelectric currents are then amplified to about a third horsepower and made to operate an engraving tool which cuts into the metal plate light and dark lines, corresponding to the shading of the photograph. For newspaper work eighty lines per inch has been adopted and half-tones made in this manner have been shown to cost about ¾ cent per square inch.

The three-color process makes its own color separation by means of the phototube. A phototube sensitive to only one color in the ordinary 3 color scheme is used. The tube very accurately selects the color portion that is to be printed on its individual plate. Three scannings of the colored photograph are therefore necessary, but all three may be made at the same time.

New Shatter Proof Glass

A glass with the high elasticity and flexibility of spring steel; a glass with the finest of safety and shatter-proof properties; a safety glass which obviates the use of an adhesive medium between individual plates, is the new product of a German company.

The production of such a glass is a most radical departure in the manufacture of shatter-proof glass. However, contrary to a first impression, the process of manufacture is simple. The whole secret of the glass is in the annealing process it undergoes. The plates are cut to exact dimensions and after heating to the annealing temperatures are carefully cooled by properly adjusted air currents blown vertically against or horizontally across the plates. This is not a hardening process, but rapid cooling sets up certain stresses in the glass; in the center the glass is under tension, at the surface a compressive force is evident.

To illustrate the remarkable properties of the glass the following tests and specifications are offered. A ¼ inch plate 4 feet by 1 foot when supported at both ends carried the weight of three men without breaking or being deformed. A violent impact does not sliver the glass into sharp splinters, but rather causes it to fall into harmless, small, rounded pieces. Molten lead when poured onto cold glass causes no cracking or bending. A plate 3½ feet by 1 foot when subjected to 800 vibrations per minute resisted 400,000 impacts without evidence of change in properties.

Tests made in the Prussian Laboratory of Testing Materials showed a resistance to bending of from 27,000 to 40,000 pounds per square inch according to the thickness, whereas ordinary glass of corresponding dimensions gave only 4,125 to 8,830 pounds per square inch.

This glass is being widely accepted in Germany and used in automobile bodies, street cars, railroad coaches, and especially in chemical laboratories where glass of high heat resistance is necessary.

Propellors for Miss America X

When Gar Wood averaged 124.91 miles per hour on the St. Clair river, September 20th, in his boat Miss America X and regained the world speed record, his feat was hailed with enthusiasm by all people, but few realized what difficulties were encountered in the building of the speed queen. No one comprehended the strain to which the two small propellers that drove the boat were subjected. Since the record-setting run, the details of the design and construction of these propellers has been commented on not only as to their exceptional performance, but as to their unique design.

Consider the stress to which the propellers were subjected. Miss America's four 12 cylinder engines delivered 6,400 hp. to her propellers. At 7,700 R.P.M. each propeller had to transmit 3200 hp. without an appreciable deformation. Bending to the slightest degree would have lowered the R.P.M. and the efficiency. Vibrations set up by unbalanced propellers would have meant greater strain on the drivers of the boat as well as impaired performance. The propellers were sometimes thrown clear of the water and while in air gained speed and then when resubmerged the impact was a terrific strain on the blades. All these factors had to be taken into consideration in the design.

In designing the propellers the following data were obtained using the conventional type of propeller: thrust load 5000 pounds per square inch, centrifugal load 8000 pounds per square inch, resultant bending 15,000 pounds per square inch, total 28,000 pounds per square inch. The aluminum bronze to be used had a proportional limit of 30,000 pounds per square inch, therefore showing that either the design or the metal had to be changed to insure safe propellers. Due to the difficulties peculiar to each other alloy that could have been used, it was decided to change the design.

A new design known as the "equipoise" propeller was tried. A propeller suitable for a small fast speedster was made. This was tested by trial runs on a boat which had previously been subjected to intense vibration caused by use of the ordinary type of propeller. The tests were very favorable and the vibration was eliminated. Propellers of both types were then given fast test runs under identical conditions. The ordinary type was seriously distorted but the "equipoise" type was in perfect condition.

Four propellers were then made for the Miss America X. It was planned to use a new set of wheels for each of the two heats of the Harmsworth Trophy race, but at the end of the first heat the original propellers were in such good shape that it was unnecessary to change them.

Did You Know That

In Germany a steam boiler has been invented that revolves on the same shaft with the rotor of the turbine for which it generates steam. The steam is at a pressure of 1400-1700 pounds per square inch and the feed water is not pumped or injected but is introduced utilizing the centrifugal force of the revolving boiler. It is claimed that the boiler-turbine-generator set can be more cheaply built, more cheaply operated, and will occupy one-third the space of a corresponding modern boiler plant. A wide use of this principle is predicted in locomotives and ships.

A study of lightning preparatory to the design of insulation and structures for the transmission lines from the Hoover Dam is being undertaken at the Ryan Laboratory of Stanford University. The generator used for these tests will produce a 3,000,000 volt surge having 20,000 watt-seconds of energy.

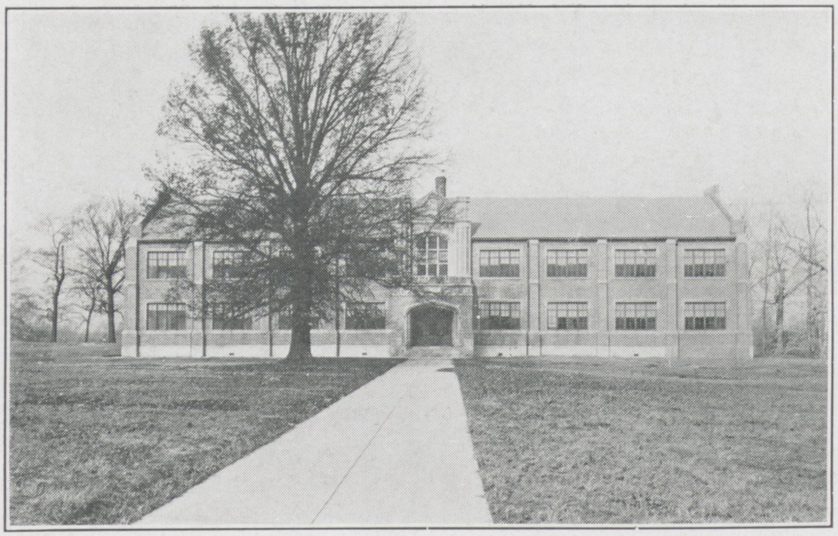
A 60 inch searchlight reflector with an absolutely non-tarnishing surface has been produced through the use of platinum for the United States Army. The metal coating is applied electrically by a method which is the result of 14 years of research. There is only one laboratory in the world capable of making this reflector.

Two former U. S. torpedo boat destroyers are now carrying bananas from Central America to the States. The vessels U. S. S. Worden and U. S. S. Putnam have been converted to Diesel powered fruiters. Their advantages are many. They give speed for small power consumption, are very seaworthy, draw little water, and are therefore useful in both river and sea navigation. These two ships have proved so successful that it is planned to convert two more destroyers to this type of freighter.

Following experimental work in Germany, engineers have planned a 2000 foot windmill tower with five wheels each 300 feet in diameter which as a unit are expected to develope 80,000 hp. Recent news indicates that such a tower will be erected by Germany as a contribution to the World's Fair Century of Progress Exposition in Chicago next year.

A "Vest Pocket" switchboard for controlling power and lighting circuits aboard the U. S. S. Akron is believed to be the world's smallest and lightest for its class of service and number of circuits. Th switchboard controls the generators, electric motors, storage-battery charger, and circuits to the generator room, engine room, control room, radio room, fire control, interior lights, gangway lights, running lights, instruments, electric fans, telephones, and galley equipment. The board is only 42 inches wide, 35 inches high and 12 inches deep, including all equipment on front and rear panels. Its weight is 200 pounds, but 2,170 feet of wire were used for connections alone.

The Hoover Dam will be able to hold two years' normal flow of the Colorado River. It will impound more than 30,000,000 acre-feet—that is, enough water to cover that many acres a foot deep. It will form a lake of 227 square miles, with a length of 114 miles and maximum width of 8 miles.



Campus Activities

Edited by J. A. Ritter, m., '34

A. S. M. E.

The A.S.M.E. held the first meeting after its final organization at 12:40 Thursday, Nov. 4th. Mr. Cantwell was in charge of the program, and he had arranged to have three talks by students upon mechanical subjects not pertaining to school work.

Mr. Rosenak presented the first discussion which was upon the testing of airplane engines. The nature of these tests was brought out, and the speaker described completely the layout of a testing laboratory in which can be produced conditions similar to high altitudes.

Mr. Mason spoke on the subject of water recovery in airships. Since the advent of the use of helium gas to produce the lifting power, exhaustive experiments have been performed with the aim of procuring water through some means to use as ballast.

Mr. Cantwell explained the theory of flight of the autogiro, clarifying his speech with diagrams and sketches. This machine is one of the latest improvements in the heavier-than-air machine, and its principles of flight are altogether different from those of the ordinary flying machine.

After the meeting, fourteen of the members, including Professor Gray, drove to Purdue University to a joint meeting of the Purdue, Indianapolis, and Rose branches of the A.S.M.E. At 4:30 there was an inspection trip through the new Mechanical Engineering Building which, although not yet quite complete, is capable of furnishing work for nine hundred students.

Mr. H. A. Norry gave a talk, accompanied with lantern slides, upon the uses of X-rays in the industries of today. He showed how, with the help of the X-rays, the engineers were able to improve upon such work as castings and welds.

Mr. G. A. Hawkins presented data, compiled in connection with the faculty of Purdue, that illustrated the effects of high pressure steam and established the critical point of steam. This work was carried out on the high pressure boiler installed in Purdue's steam laboratory.

Professor Holster demonstrated the use of polarized light for calculating the stress and strains in differently shaped members. The meeting was concluded by devoting a brief length of time to the answering of questions upon the subjects covered by the various speakers.

Ye Olde Customs

The football fans on the Saturday of the Rose-Earlham game received a little more entertainment for their money than the regular schedule called for. It is known by everyone that the wearing of corduroy of any shape or form is a sacred right of seniors. Still a freshman, either through neglect or ignorance, came to the game to pull Rosie around wearing trousers of the aforementioned material. Woe was his when a senior sighted them for, as hounds when they scent a rabbit, seniors ran to the chase, and with vim, vigor, and violence righted the insult cast at their class.

Trousers torn up, the much more intelligent freshman climbed up inside Rosie through a convenient hole and, when outside the sight of the spectators, he came out of seclusion to borrow a pair of trousers from some friendly freshman at the dormitory.

Probably their ire aroused by the demonstration of seniors, caused the freshmen to set out to chastize in a proper manner one of their number who, although at the game, did not seem to them to be showing the right spirit. After a long and arduous chase, also directed in a major part by seniors, they managed to get their man.

Unfortunately the football fans did not have the privilege of seeing the climax of the little affair of honor, but let it be understood that the culprit later came back to the game much cooler and decided that one compulsory swim in the lake was enough. He helped take care of Rosie until after the game.

Moral: Always abide by the customs and avoid trouble.

A. S. C. E.

At a meeting held on Monday afternoon, November 9th, Messrs. Carter and Shilling presented a

(Continued on Page 26)

Fraternities

Theta Xi

At a special meeting held Monday, December 5, Kappa of Theta Xi had the pleasure of initiating the following men: Norman Keith of New Goshen, Indiana, and Eugene Mueller of Terre Haute, Indiana.

With the coming of Christmas, the chapter turns to one of its largest social events of the year, the Annual Christmas Formal. The ball is to be held December 16 and promises to surpass any of our previous dances.

Alpha Tau Omega

At the close of the football season, four members of Gamma Gamma of Alpha Tau Omega were awarded varsity letters. Those receiving this honor were: Captain Logan Gillette, end; Orville Lowther, guard; Joe Creedon, quarterback; and Pop Morrison, tackle. This year marks the end of football competition at Rose for the first three mentioned as they have had four years of varisity competition. Morrison still has another year to play.

Alpha Chi Sigma

Iota chapter of Alpha Chi Sigma is proud to announce the pledging of the following men of the chemical engineering department: Mr. Creedon and Mr. Smith of the class of '34; Mr. Reintjes, '35; Messrs. Creal, Garmong, MacDonald, Pearson, Staley, Weinbrecht, Wilber, Overholser, Duenweg, Blair, and Clay all of the class of '36.

A most successful pledge banquet was held at the Elks' Club November 3, 1932.

Theta Kappa Nu

The premier social event of the season for Indiana Gamma is the annual Christmas dance, which will take place at the Terre Haute House ballroom the night of December 30. The dance is a formal one and is held at this time for the benefit of the chapter's many alumni who return to Terre Haute during the holidays.

The chapter is pleased to announce the initiation of Clement Gray of the class of '35, and Henry Fick of the class of '34, and the pledging of Clarence Reid, a sophomore.

Sigma Nu

Beta Upsilon Chapter of Sigma Nu announces with pleasure the pledging of Al Yates, John Mattingly, Ezekiel A. Hamilton.

Beta Upsilon takes pride in noting that Sigma Nu is well represented on the Student Council. Wilton Brown is president and Merrill Bradfield is financial secretary.

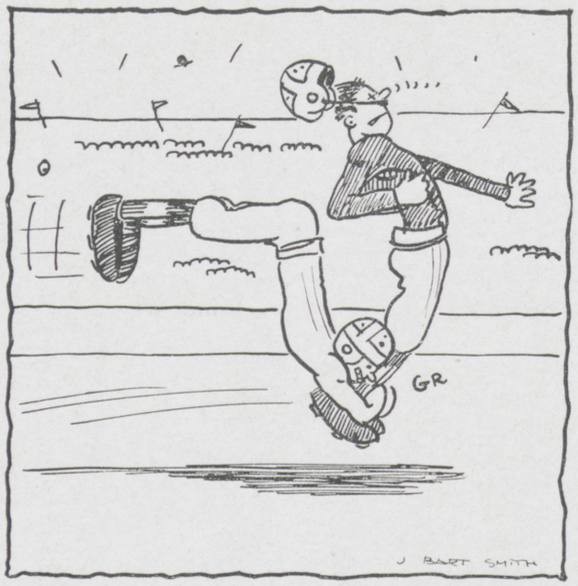
There were seven men of Sigma Nu awarded letters for their services during the course of the 1932 football season. These men were Bradfield, Detrick, Reinking, Landenberger, McCullough, DeWitt and Richardson.

Tau Beta Pi

Indiana Beta chapter of Tau Beta Pi is pleased to announce the initiation of Tom Batman, William C. Heidenreich, Russel A. Powell, James G. Brown, and John Ritter. The initiation and banquet were held at the Elks Club, Thursday, December 8. We are indeed happy to welcome these new men to our chapter.

The chapter wishes to mention the fact that at the beginning of the present semester, all the active members of Tau Beta Pi were on the optional attendance list, indicating a scholastic rating of at least 88%. We are proud of this record and expect to maintain this standing of all initiated members.

The National Convention of Tau Beta Pi was held in Washington, D. C., October 13, 14, 15. James Guymon was the delegate representing Indiana Beta Chapter.



SPORTS

Edited by Harry Richardson, m., '35

ROSE put down a fighting Union College team to win another Homecoming game. The score was 8-7, and is a real indication of the battle put up by both teams.

The teams battled on even terms for the greater part of the first half with each team having the ball in offensive territory a part of the time.

In the middle of the second quarter, Richardson crashed through and blocked one of the Union kicks. As the ball rolled over the goal line, Leitzman fell on it, but the oval bounded out of his arms and Union recovered for a safety. The half ended with the score Rose 2, Union 0.

In the second quarter a series of passes to DeWitt gave Rose a touchdown, and the try for extra point failed.

Creedon, Hilgeman, and the right side of the Rose line were the shining lights of the afternoon.

Line-up and Summaries:

Rose		Union
DeWitt	LE	Pierson
Leitzman	LT	Simpson
Lowther	LG	Combs
Landenberger	C	Bailey
McCullough	RG	Cather
Richardson	RT	Williams
Bradfield	RE	Burch
Weinbrecht	QB	Patterson
Hilgeman	LH	Elam
Campbell	RH	Landreth
Hufford	FB	Richlin

Score by quarters:

Rose	0	2	6	0—8
Union	0	0	7	0—7

Scoring—Rose, DeWitt (touchdown). Union—Landreth (safety), Patterson (touchdown) Richlin (point after touchdown).

Rose vs. Earlham

Coach Phil Brown's band of Fighting Engineers put down a scrappy Earlham eleven by a score of 12-6.

In the first ten minutes of the opening period Earlham ran Rose ragged, and it was a wonder that they didn't score more than they did. A first down on the Rose two yard line gave them their chance to score, and Sewin, a guard, came back into the backfield and scored on the third down.

From then on there was a different Rose team on the field. They stopped the rush of the Earlham eleven and started to take the ball down the field themselves. After a hard struggle with the tough Earlham defense, Rose scored when Hilgeman went off the weak side tackle for a touchdown to climax a series of weak side plays by Hilgeman and Detrick. The try for extra point failed and the score was tied at six-all as the half ended.

Rose received the kickoff to start the second half, and Creedon ran behind almost perfect interference through the entire Earlham team for an eighty yard run and a touchdown. The try for the extra point again failed and the score was 12-6.

Creedon and Hilgeman were the star performers for the Engineers.

Line-up and summaries:

Rose		Earlham
Bradfield	LE	Stonerock
Leitzman	LT	Gottschalk
Lowther	LG	Sewin
Landenberger	C	Dickinson
McCullough	RG	Hill
Richardson	RT	Scott
DeWitt	RE	Druley
Creedon	QB	Hampton
Hilgeman	LH	Thompson
Cauley	RH	Katsetter
Detrick	FB	Kausel

Score by quarters:

Rose	0	6	6	0—12
Earlham	6	0	0	0— 6

Touchdowns—Rose, Hilgeman, Creedon. Earlham, Sewin.

Rose vs. Aurora

Rose ended its season in a burst of glory by swamping Aurora College by a score of 38-7.

From the first whistle, it was evident that the Engineers were out for business. They easily scored four touchdowns in the first half and two in the second. The second and third teams played part of the game, contributing two touchdowns.

The whole Rose first string played excellent ball, and they left Rose with a season record of five victories and three defeats, which is pretty good in this season of surprises and upsets.

Line-up and summaries:

Rose		Aurora
Gillette	LE	Burr
Grogan	LT	Keepers
Lowther	LG	Bugbee
Landenberger	C	Huggins
McCullough	RG	Perkins
Richardson	RT	Stephens
Bradfield	RE	Weiss
Creedon	QB	Shaw
Hilgeman	LH	Stone
Cauley	RH	Seibut
Detrick	FB	Raines

Score by quarters:

Rose	20	6	6	6—38
Aurora	0	0	0	7— 7

Scoring—Rose, Detrick 2, Creedon 1, Campbell 2, Hilgeman 1, Richardson (point after touchdown), Detrick (point after touchdown).

Aurora, Cantrell 1, Shaw (point after touchdown).

Linotype Machine

(Continued from Page 6)

mouthpieces into the mold wheel, and directly into the die-cut letters of the line of matrices.

The line of type now has been cast, or manufactured. A three-quarter turn is now made by the mold wheel, placing the line of type into ejecting position, and it is ejected by an ejector blade forcing the line of type out of the mold wheel. The ejector blade is operated off the mold cam driving gear, (cam No. 8) in the rear of the machine.

While the line of type is being ejected, the first elevator travels upward some 12 inches to the intermediate transfer channel, where it aligns with the "second elevator" which has moved downward from the top of the magazine, and while it is in this position a left finger and right finger transfer the line of brass matrices to the second elevator bar. This transfer is actuated by a large coil spring, and the fingers are returned by cam No. 10 in the rear of the machine.

The second elevator now returns to the top of the magazine, to place the line of brass matrices in readiness for their distribution. The first elevator returns to the "home" position, ready to receive another line of matrices.

Distributing Mechanism

In order to facilitate the distribution of matrices, each matrix has saw-toothed combinations. These combinations are called carrying combinations. Each individual matrix has its special combination.

In the transferring of the matrices to the second elevator, these combinations cling to a "V" threaded bar on the second elevator which aligns itself with the bar in the distributor box.

The matrices are pushed through the distributor box and at the inner end are lifted up by the matrix lifter, which separates the matrices and allows them to be carried along the distributor combination bar which extends across the top of the magazine.

This distributor bar is technically called the combination bar, having 90 combinations corresponding with the combinations of the 90 different matrix characters. The distributor screws running parallel with the combination bar slide the matrices along the combination bar until the matrices meet their respective combinations on the combination bar—then they drop off, having nothing to hold them to the combination bar.

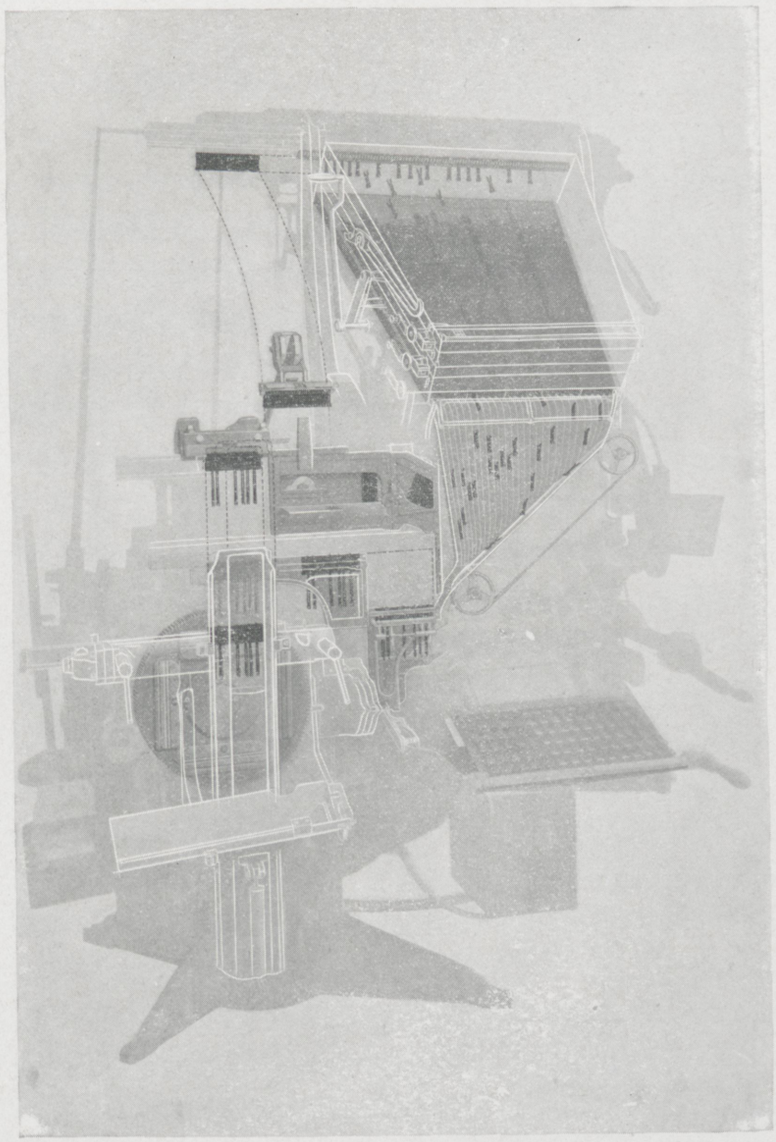
Gravity carries the matrices through the distributor entrance channels and to the magazine grooves. Gradually they work their way down the magazine, and finally over the verges, there to await their turn to be used in a new line of type.

Practically every function of the linotype is actuated by coil springs or gravity, and after accomplishing their purpose the respective parts are returned to their original position by the operation of cams. This arrangement in the construction assures safety, and eliminates the danger of forcing any moving part. The machine is also provided with several automatic stops which stop the machine's operation if anything has gone wrong with the procedure.

Development of "Chains" Forecast

In the linotype machine itself there is now very little room for improvement as they have multiple magazines, auxiliaries, and all manner of devices for making the operation easier. The only thing which is likely to come in the future is the linking of many

(Continued on Page 22)



Phantom view of linotype machine. Note distributing mechanism.

Linotype Machine

(Continued from Page 21)

linotype machines to one head office and the running of them all by one operator in the manner of of the modern teletype which is in common use in the newspaper service today. This project is in its infancy, and, although several trials have been made throughout the eastern states, the complications met have defeated this move. With extensive experimenting and work a time may come when all the international and national news will be set up by a system of such machines in all large newspaper offices.

Nickel as a Catalyst

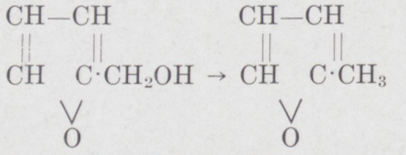
(Continued from Page 9)

otherwise determined by experiment.

Results Obtained by Hydrogenation over Nickel

1. Furfuryl Alcohol.

This alcohol subjected to a careful hydrogenation over nickel at 190°, yields methyl furfurane.



2. Carbon Disulphide.

Carbon disulphide when hydrogenated over nickel below 200°, gives an addition product having a very disagreeable odor. This gas appears to be methylene-dithiol, $H_2C(SH)_2$. However, if the operation is carried on at 450°-500°, in an excess of hydrogen, the reaction takes place thus:

$$CS_2+2H_2 \rightarrow 2H_2S+C$$

This reaction is utilized in freeing coal gas from carbon disulphide which it contains up to .02%.

3. Aromatic Nitro Compounds.

Above 200° nitrobenzene is rapidly transformed into aniline, but the aniline is immediately hydrogenated to form cyclohexylamine.

$$C_6H_5NO_2+H_2 \rightarrow C_6H_{11}NH_2$$

If only slightly active nickel is used, the nucleus is not hydrogenated and aniline is the only product.

Above 250°, a part of the nitrobenzene is reduced to benzene and ammonia.

$$C_6H_5NO_2+13H_2 \rightarrow C_6H_6+NH_3+2H_2O$$

4. Carbon Monoxide.

The direct hydrogenation of carbon monoxide over nickel gives a simple method for the synthesis of methane.

$$CO+3H_2 \rightarrow H_2O+CH_4$$

The reaction commences around 180°-200° and goes on rapidly without complication at 230°-250°. With the theoretical mixture of hydrogen and carbon monoxide, 3 to 1, the reaction is practically complete.

5. Hydrocarbons.

Ethylene is hydrogenated by nickel from 30° up. The reaction which continues indefinitely, with evolution of heat, gives ethane exclusively.

6. Unsaturated Alcohols.

Allyl alcohol, $CH_2{:}CH{\cdot}CH_2OH$, is readily hydrogenated at 130°-170° over nickel, to give nearly pure propyl alcohol, containing only a slight amount of propionic aldehyde.

7. Unsaturated Acids.

The vapors of oleic acid, carried along by a violent current of hydrogen over nickel at 280°-300°, are readily transformed into solid stearic acid.

8. Aliphatic Aldehydes.

The vapors of formaldehyde at 90° are readily transformed into methyl alcohol.

9. Phenols.

The direct hydrogenation of the aromatic nucleus can be readily accomplished in phenol and its homologs by the use of nickel. When phenol is hydrogenated at 180° over nickel it gives immediately cyclohexanol, $(CH_2)_5CHOH$, containing 5 to 10% of unchanged phenol.

10. Aliphatic Amides.

Acetamide is readily hydrogenated at 230° by nickel with the production of water and ethylamine and also dimethylamine, due to the decomposition of the primary amine by the metal, and a small amount of ammonia.

11. Aromatic Aldehydes.

Benzaldehyde gives toluene and benzene when hydrogenated over nickel at 225°.

$$C_6H_5{\cdot}CHO+2H_2 \rightarrow H_2O+C_6H_5{\cdot}CH_3$$

$$C_6H_5{\cdot}CHO \rightarrow CO+C_6H_6$$

12. Hydrogenation of Liquid Fats.

When liquid fats are hydrogenated the melting point is raised and the liquid usually changes into a solid fat, that is, the more solid the more oleine is transformed to stearine.

The oil to be hydrogenated must be carefully purified before the introduction of the nickel. Hydrogen sulphide immediately renders inactive 100 times its weight of nickel and pulverized sulphur is half as effective. Free chlorine kills the nickel instantly. A practical way to purify these oils is to agitate them with spent catalyst which abstracts the harmful substances.

Oils frequently contain free fatty acids which attack the nickel and render it inactive; therefore it is best to introduce pulverized calcium carbonate and neutralize the acids. The neutral oil thus obtained may be freed of its toxic properties by agitating it hot with freshly precipitated cupric hydroxide.

If the oil contains moisture it is best to dry the gas before using it. This can be done by refrigeration to 20°. The moisture if left in the oil would lead to a certain amount of saponification.

Method of Hydrogenation of Liquid Fats

About 2 to 3% of nickel distributed on inert material is employed. The temperatures most frequently used for hydrogenation with nickel are around 180°.

A vigorous agitation brings the oil, catalyst and hydrogen together in the same vessel. The pressure employed will vary from 2 to 15 atmospheres.

Results Obtained by Hydrogenating Liquid Fats with Nickel

1.

	Melting Points	
Hydrogenated Oil		Original
*Olive Oil	70°	6°
*Linseed Oil	68°	-16°
*Cod Liver Oil	68°	-10°
*Cocoa Butter	64°	23°

*Taken from Sabatier.

The iodine number becomes small in each case.

2. Castor Oil.

When castor oil is hydrogenated over nickel it gives a very hard white solid which melts above 80° as compared with -18° originally. The white hard solid has been advantageously employed as an electric insulator.

Attempted Explanation of Hydrogenation Phenomena

With nickel, the process of hydrogenation goes on as if there were formed on the surface an actual unstable hydride capable of liberating hydrogen in the atomic condition, and consequently more active than the original molecular hydrogen. The facts lead even to the idea that there are two stages in the fixation of hydrogen such as

$$\begin{matrix} Ni{-}H \\ Ni{-}H \end{matrix} \text{ and } Ni < \begin{matrix} H \\ H \end{matrix}$$

the latter more active combination being formed by metal reduced from the oxide below 300° and capable of more kinds of work. The former, less active combination, would be produced by nickel reduced above 700°, or made from the chloride and able to hydrogenate ethylenic compounds, nitriles, and nitro bodies but not the aromatic nucleus. The catalytic hydrogenation of an ethylene hydrocarbon would be represented by:

$$H_2 + Ni_2 \rightarrow Ni_2H_2$$
$$Ni_2H_2 + C_2H_4 \rightarrow C_2H_6 + Ni_2.$$

The regenerated nickel would continue indefinitely to produce this effect so long as the hydrogen and ethylene continued to arrive simultaneously.

Conclusions

The success of the process of hydrogenation of chemical compounds is largely due to the abundance of cheap hydrogen recently placed upon the market. Several large companies have spent considerable time and money on this problem of hydrogenation. A large oil refining company is now perfecting a process for the hydrogenation of crude petroleum. In 1916, there were as many as 24 large plants carrying out the hydrogenation of edible oils. A more recent estimate according to information obtained from Dr. Wesson, hydrogenation is carried on in the United States by about 60 concerns, and hydrogenated oils are important constituents in some 92 brands of shortening. The future of this industry seems very bright, because countless numbers of compounds can be altered to fit a demand.

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Industrial Chemistry, Rogers.

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Mrs. Old Timer: "It says here in the paper that the young girls today are abandoning all restrictions."

Mr. Old Timer: "Well, I'd better not catch Mable without hers on."

Motz to Professor Knipmeyer: "Professor, would you mind if I digressed a moment and asked a question about today's lesson."

Spontaneous Effervescence

Edited by Joseph H. DeWitt, c., '35

Dr. White to chemistry class: "Yes, the inside of the earth is a molten mass of rock and flame."

Campbell: "Ain't that hell?"

"I pulled a good one that time," remarked the farmer as he finished milking the cow.

The mid-term grades are more evidence of the truth of Ibsen's statement, "the compact majority is always wrong."

The results of the intelligence tests have just been turned in. Here are some of the choicer answers:

"A vacuum is a large empty space where the Pope lives."

"In China a man of one cask may not marry a women out of another cask."

"An angle is a triangle with only two sides."

"Gravitation is that of which if there were none we should all fly away."

"Louis XVI was gelatined during the French Revolution."

"Horse Power is the distance that one horse can carry a pound of water in one hour."

Judge (to amateur yegg): "So they caught you with this bundle of silverware. Whom did you plunder?"

Yegg: "Two fraternity houses, your Honor."

Judge (to sergeant): "Call up the downtown hotels and distribute this stuff."

—*Utah Humbug*

Henry: "Is she pretty modest?"

John: "Well, she's pretty."

"Hay, hay," said the old cow as the farmer tossed her a bundle of straw.

Anybody: A Nigger in the woodpile.

An engineer: A Darky in the kindling.

A forester: An African in the lumber.

A chemist: An Ethiopian gentleman in the cellulose.

Modern child, saying grace: "This food comes to you through the courtesy of God Almighty, Amen."

—*Utah Humbug*

Cleopatra: "Gee, it's way past midnight. You had better get started."

Anthony: "O. K., blow out the candle."

—*Sewanee Mountain Goat.*

"Are you married?"

"That's my business."

"Well, how's business."

"Would you be interested in joining a fraternity?"

"No, thanks, I have some clothes of my own."

He: "I can read your thoughts."

She: "Well, what are you waiting for, then."

"Helen, is that young man there yet?"

"No, father, but he's getting there."

She was only a taxidermist's daughter, but oh, how she knew her stuff.

—College Life.

"Phew," remarked Mr. Bloxsome as he was walking down the hall with Mr. Hoel, "What's that I smell?"

"Oh, nothing," replied Mr. Hoel, "Just Dr. Sousley roasting his class."

"You've heard about the Scotchman who went to the Studebaker company with a basket under his arm to get some of the free wheeling?"

"Well, how about the Scotchman who went to Russia to get some free love?"

—*Southern Calif. Wampus.*

Wife: "Dear, tomorrow is our tenth anniversary. Shall I kill the turkey?"

Hubby: "No, let him live. He didn't have anything to do with it."

—*Utah Humbug*

Dr. Foolem: "Plenty of exercise will kill all the germs."

Ailing One: "Yes, but how in the name of heaven can you get them to exercise."

She was just an optician's daughter—two glasses, and she made a spectacle of herself.

Guide: "This, sir, is the leaning tower of Pisa."

Tourist: "Pisa! Let me think. No, that does not sound like the contractor's name who built my garage, but it looks like a piece of his work."

Helen: "Some moon, isn't it?"

John: "Some dew, too."

Helen: "Well, I don't."

Supersaturated Steam

(Continued from Page 7)

not in thermal equilibrium and supersaturation or sub-cooling results. This condition is of course temporary, and very soon after passing through the nozzle, condensation occurs and the steam returns to a state of equilibrium.

The effect of this temporary supersaturated condition is quite noticeable, as it affects the mass rate of flow of the steam through the nozzle. Supersaturated steam is more dense than saturated steam at the same pressure and temperature, so that the quantity of steam discharged is greater sometimes by as much as 5% than would normally be the case, The result is that while we normally expect the coefficient of discharge of a nozzle to be slightly less than unity, due to friction losses, we actually get coefficients slightly larger than unity when supersaturation occurs.

This was first observed by R. v. Helmholtz who published a discussion of this phenomenon in Annalen der Physik in 1887. Later experiments by Aitken, Wilson Callendar and by Stodola have gone far towards clearing up the uncertainties surrounding this phenomenon. Stodola, in his book "Steam and Gas Turbines" presents a thorough analysis of the whole process involved in delayed condensation and the formation of drops of water. The expansion of steam with supersaturation is represented by the equation pv^k== constant with k=1.3.

Most text books on Thermodynamics either ignore the phenomenon of supersaturation, or refer to it very briefly, but it is a subject which the steam turbine designer must take into account if he expects the steam nozzle of his turbine to perform in accordance with his theoretical calculation.

The Camden and Amboy

(Continued from Page 11)

than the present stanard rail, which weighs one hundred and thirty pounds to the yard.

The adoption of the 152-pound rail, which is the result of investigation and research over a period of two years by committees of the Pennsylvania's Engineering Department, the United States Steel Corporation and the Bethlehem Steel Company, is in accordance with the policy of modern railways to anticipate the future demands of transportation, and to be ready at all times to render the highest class of service.

Robert Dallas Landrum

(Continued from Page 15)

Chemists' of New York, Medinah Athletic Club and Chicago Drug and Chemical Association, (Chicago).

Turning now to his domestic and private life, he married Ethel Price Sherwood in 1908. They have three children—Sherwood, Robert James, Kate Tolbert. In religion he is a Methodist; in politics, a Republican; and he claims the Masons as his lodge.

Mr. Landrum is one of the most widely known and popular men in the ceramic industry, and we of the *Rose Technic*, congratulate him on his many achievements and say to him, "We're proud of you!"

Alumni

(Continued from Page 15)

'15 We quote from a letter received from W. F. Turner: "Please be advised that I have been promoted June 1st, 1932 to Division Manager of the Wisconsin Power and Light Co. with offices at Madison. My address is 502 Virginia Terrace, Madison.

"I have a great deal of contact with the University of Wisconsin here and know a large number of the professors, but I am glad I did not attend school here. The Electrical Laboratory is not as good as our old one in Terre Haute."

'17 Thomas M. Evans, who was Section Head, General Electric Co., Erie, Pa., has been transferred to Pittsfield, Mass.

(Continued on Page 26)

Alumni

(Continued from Page 25)

'23 We have a note from H. J. McDargh, Jr., which reads: "January 1st, 1932, I was moved to Chicago to become Office Manager of Midwestern offices which have charge of Association activities in eleven states." It will be remembered that Mr. McDargh has been with the Portland Cement Association for some time, being at Columbus, Ohio before this change. He may now be addressed at 33 W. Grand Ave., Chicago, Ill.

'27 The General Electric Company informs us that E. W. Cunningham was recently transferred from the Industrial Heating Engineering Department to the Testing Department of the General Electric Company at Schenectady, N. Y.

'29 Clarence Muntz, who is with the U. S. Geological Survey, is stationed at Illinois University, Urbana.

Cupid Calls

Carl Ehrenhardt married Miss Virginia McKibben Nov. 29 at the bride's home. Carl was an A.T.O. while at Rose. The *Technic* joins with his friends in congratulations. The couple will make their home in Schenectady, where Carl is employed by the General Electric Company.

Campus Activities

(Continued from Page 18)

lecture, illustrated by slides, on the Florianopolis suspension bridge. Notable features of this bridge are that it has the longest span of any bridge in South America and the longest eyebar suspension in the world. The bridge was constructed for the state of Santa Catarina, Brazil, and spans the waters of a strait of the Atlantic Ocean. It is designed to carry a highway, an electric railway, and a water-supply main to Florianopolis, the island capital of the state.

Arrangements have been made so that Mr. J. T. Hallet, Assistant Chief Engineer, Indiana Highway Commission, will be the speaker at the next meeting scheduled for some time in December. Mr. Hallet is a graduate of Rose of the class of 1914.

Assemblies

A departure from the regular trend of assemblies was presented to the student body on November the 17th. A string quartet, led by Mr. Arthur Hill, played a program of popular music. Mr. Hill announced his own numbers explaining that by popular music he meant not jazz, but music which was recognized both here and abroad. It was of interest to know that Mr. Hill was at one time a student at Rose Poly but forsook the field of engineering for that of music.

This was the second diversion from the straight path of speakers, the first being a presentation of magic by an Indian magician some time ago. It is hoped that in view of the variations in the programs, the students will not look upon the assembly period as a distasteful waste of time.

Physics Department

Professors T. A. Hunter, B. A. Howlett, and H. A. Moench, of the Rose Polytechnic Physics Department were on the program of the Association of the Indiana College Physics Teachers Conference which was held Friday and Saturday, October 28th and 29th, at Central Normal College, Danville, Indiana.

Professor Hunter spoke on "The Camel and the Dromedary", Professor Moench presented a lecture on "The Determination of the Deviations from Child's Law for Vacuum Tubes"; and Dr. Howlett had as the subject of his speech "The Photoelectric Photometer".

The conference was well attended by workers in the field of physics from practically every college in the state. Many interesting subjects were presented to the assembly for discussion.

Wisdom is knowing what to do next, and character is doing it.—David Starr Jordan.

INDUSTRIAL PROGRESS

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"A College of Engineering"

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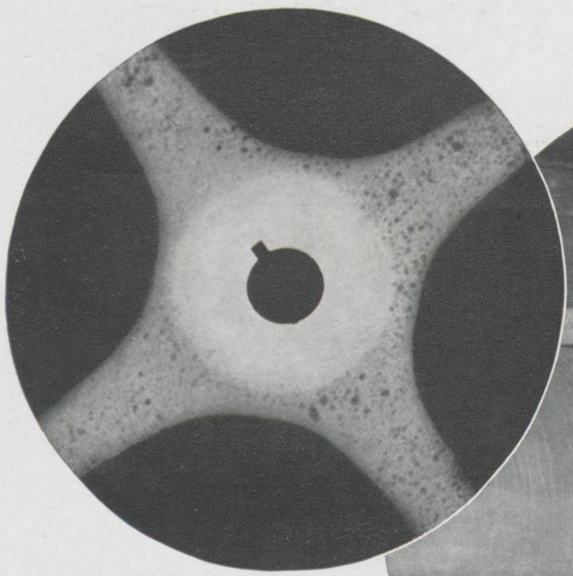
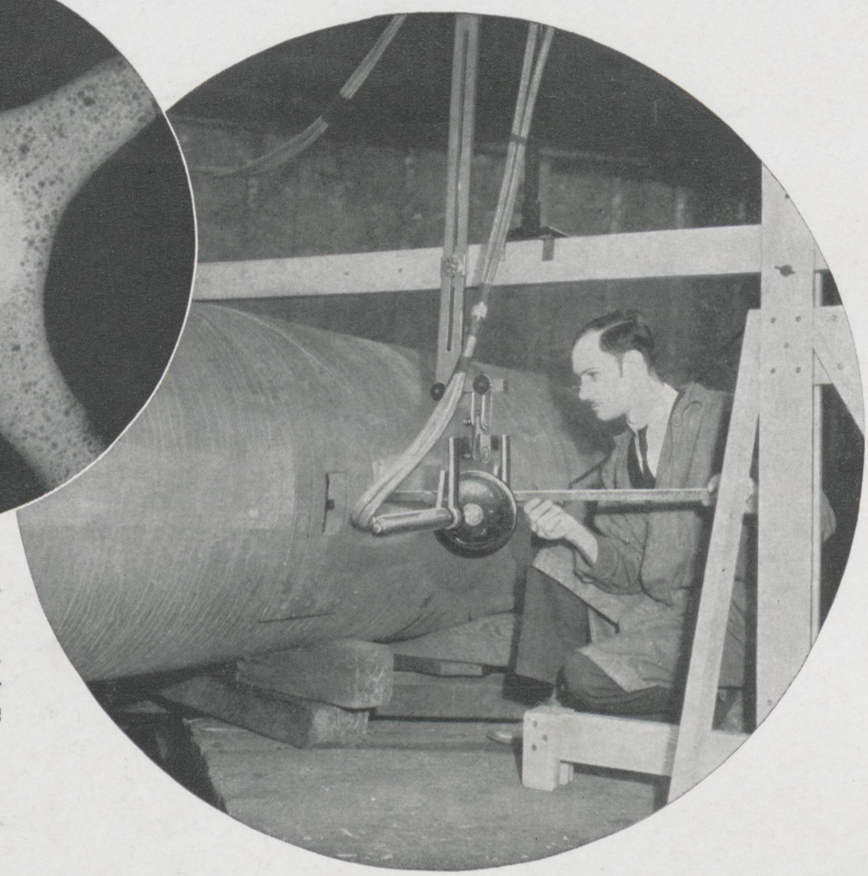
Seeing through steel





(above) Radiograph of a casting, showing defects due to blow holes

(right) Apparatus in position to x-ray through four inches of steel in a forging

WHEN Prof. Röntgen announced his discovery of the x-ray, in 1895, he intimated that medical science would not be the only beneficiary. Since then, General Electric has been a pioneer in the development of the x-ray for industrial as well as medical use. • As a result, a new science — industrial radiography — enables us to peer at the internal structure of almost any material. Radiography reveals most microscopic defects in metals — blow holes, shrinks, pinhole porosity, cracks, dross inclusions, etc. — without destruction of the specimen. Even four inches of steel is no obstacle to the modern radiographer. • "Seeing through steel" has become a reality with the new and more powerful x-ray tubes developed by General Electric. These tubes, using as much as 400,000 volts, make possible the most powerful x-rays available to industry. Such developments are largely the accomplishments of college-trained engineers. They are leading the way to even greater progress in the electrical industry and are helping to maintain General Electric's leadership in this field.

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